sample for transmitting said laser light of a specific laser excitation wavelength and rejecting light of other wavelengths;

one or more lenses positioned between said sample and said coherent fiber bundle;

a spatial filter positioned between said sample and said coherent fiber bundle for controlling the angular field of view of said coherent fiber bundle;

one or more white light illumination fibers for transmitting white light from a second light source to said sample;

a housing for enclosing said fiberscope; and

a window disposed at the distal end of said fiberscope

wherein said coherent fiber bundle can be positioned and focused with respect to said sample using light collected by said coherent fiber bundle.

Cont'd A9

REMARKS

Two paragraphs in the specification were amended above to correct clerical errors. No new matter was added by these amendments

In paragraph 1 of the detailed action, the Examiner has required a restriction between claims group 1, containing claims 1-25 and 27 and claims group 2 containing claim 26. The Applicant has chosen to prosecute group 1, claims 1-25 and 27. Provisional election was made without traverse during a telephone call with the Examiner on 19 November 2001. The provisional election is hereby affirmed and claim 26 is withdrawn from further consideration

In paragraph 2, the Examiner states that the information disclosure statement previously filed fails to comply with 37 C.F.R. § 1.98(a)(2), requiring a legible copy of each reference. The Applicant assumes that the Examiner is referring to U.S. Patents 5,922,017 and 5,901,261, which were listed on the IDS supplied by the Applicant, but which were not considered. The Applicant is providing herewith copies of those references.

In paragraph 3, the Examiner has objected to claim 24 because of a lack of antecedent basis for the phrase "said imaging spectrometer." Claim 24 has been modified to depend from claim 23, which contains the requisite antecedent phrase.

In paragraph 4, the Examiner has objected to the claims in general because they have been single spaced. The Applicant has attached hereto, in Appendix C, sheets containing

substitute claims with 1.5 line spacing. The claims submitted are the claims as originally filed and not as amended herein.

CLAIM REJECTIONS

In paragraph 6, the Examiner has rejected Claims 1-9, 18, 19, 21 and 22 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 6,222,970 (Wach, et al.). In response to this rejection, the Applicant has amended the claims to include the limitation of claim 2 that the collection fibers be arranged in a "coherent bundle." In addition, the Applicant has added the limitation that the coherent bundle be *capable of transmitting a clear and organized image* of the sample based on the light scattered, reflected or emitted from the sample.

The Applicant respectfully submits that this limitation is not disclosed in Wach, et al. or in any other reference cited by the Examiner. Wach, et al. discloses a bundle of fibers having a center fiber that is used to transmit light and six or seven fibers surrounding the central fiber for use in collecting the light (or vice versa.) Such a configuration would not be capable of transmitting a clear image from the sample to the other end of the fibers. To anyone of average skill in the art of image construction through a fiber system, a six or seven element fiber is not consistent with the transmission of an image of any quality.

Support for the importance of the imaging aspect of this invention can be found in the specification of the present application on page 7, lines 1-19, which states as follows:

> *Video imaging* of the sample is performed by shining white light on the sample. The white light is transmitted via fibers 26. High quality imaging optics are employed to provide the ability to visually inspect the sample area and to obtain *Raman chemical images*. Collection lenses 22 focus an image of the sample on the image collection bundle 18. The coherent image collection bundle 18 independently captures white light and Raman scattered photons from the sample surface. The Raman chemical imaging fiberscope provides remote real time video imaging of the sample when the white light is directed through the image collection bundle 18 to a video CCD. *Live video* capability assists insertion of the fiberscope and allows visual inspection of the sample area in preparation for spectroscopic analysis ... As shown in Figure 2, once collected, the Raman scatter can be diverted in two directions. When sent to a dispersive spectrometer, the Raman chemical imaging fiberscope provides conventional Raman spectral information. The Raman scatter can also be directed through a liquid crystal tunable filter (LCTF) imaging spectrometer onto a sensitive digital CCD. Because the Raman image is maintained through the image collection bundle 18, *high quality Raman*

chemical images can be collected across the fiberscope field of view.

(Emphasis added)

The Applicant respectfully submits that Wach, et al., in disclosing the use of only six or seven light collection fibers, teaches away from imaging and toward point measurement of the sample. Further, Wach, et al. does not disclose constructing an image with light transmitted through a fiber. The focus of Wach, et al. is a discussion of techniques for constructing fibers both through from a mechanical and physical point of view and from a materials point of view. Wach, et al. describes the use of Raman spectrometry as an example of the use of the specialized fibers. The ***measurement*** approach described in Wach, et al. provides single point measurements whereas *imaging*, as disclosed in this application, is inherently a higher parallel multipoint approach to measurement and requires true image preservation through the fiber bundle.

c/l 36, lines 45-48

With respect to this application, the meaning of the term "coherent fiber bundle" is a set of fibers capable of transmitting an image from one end of the bundle to the other with enough resolution such that a person can distinguish features as if in a clearly focused photograph, or such that an image analysis routine running on a computer can resolve the image in digital form. This requires a fiber system having many elements which are both aligned and well organized at both ends of the bundle. The image clarity comes from the number of elements in the fibers. An analogy can be drawn between the number of elements in the fibers and the number of pixels in a digital image. Clearly, the greater the number of pixels in the image, the greater the resolution and clarity of the image. Additionally, it is important that the fibers be organized such that the image transmitted at the sampling side of the cable be faithfully reproduced at the sensing side of the cable. This reproduction comes from the proper alignment and positioning of each fiber in the cable with respect to the other fibers.

The Applicant respectfully submits that the amendment of the claims to include the limitation of the "coherent fiber bundle capable of transmitting an image" renders all claims using that language as distinguishable over Wach, et al. because this reference does not disclose (1) using a fiber bundle having enough fibers to transmit a high quality image, but only a fiber bundle containing 6 or 7 fibers; and (2) using a coherent fiber bundle, which, in this case, means

argmt

that the fibers must be well organized and aligned at both ends of the bundle to be able to transmit the high quality image.

With respect to claims 2-9, claim 2 has been deleted and its limitation included in independent claim 1.

Claims 3, 5, 6, and 7 now depend, directly or indirectly, from claim 1, which the Applicant respectfully submits is patentable in light of the amendments herein and the remarks above. Therefore, these claims should also be patentable.

With respect to claim 4, the Applicant has added the limitation that the lenses specified in the claim be used for focusing the image onto the coherent fiber bundle. Wach, et al. at column 61, lines 11-25, discloses a lens having an offset axis for steering the collection pattern and the delivery of light pattern off axis. A lens for the purpose of focusing an image onto a coherent fiber bundle as described in the application and in this response is not disclosed. Therefore, for this additional reason, claim 4 should be patentable.

With respect to claim 8, the Examiner states that a spatially patterned filter is disclosed in columns 53, lines 9-22 of Wach, et al. The Applicant respectfully submits that the cited passage from Wach, et al. discloses a filter for the delivery fiber (i.e., a low pass or band pass filter) and a filter for the collection fibers (i.e., a band stop or high pass filter). However, the cited passage does not disclose the use of a single filter that is spatially patterned to perform multiple functions, but instead discloses two separate filters, one a low or band pass filter, and the other a band or high pass filter. The spatially patterned filter of claim 8 is patterned such that the top half is a filter and the bottom half is transparent, wherein the transparent portion merely transmits the light scattered or reflected by the sample to the coherent fiber bundle.

With respect to claim 9, the Examiner states that Wach, et al. discloses a filter selected from a group comprising dielectric, holographic and rugate types in column 72, lines 52-53 and column 81, lines 5-8. The Applicant respectfully submits that this passage only discloses a rugate type filter and not a dielectric or holographic type filter.

With respect to claims 18, 21 and 22, which are independent claims, the Examiner has rejected these claims over Wach, et al. in a manner identical to the rejection for claim 1. The Applicant has modified these claims in the same manner as claim 1 by adding the limitation of a "coherent fiber bundle which is capable of transmitting a clear image of the sample." The same remarks made above for claim 1 therefore also apply to claims 18, 21 and 22, mainly that Wach,

et al. teaches away from the collection of an image by only specifying six or seven collection fibers, an arrangement that would be incapable of transmitting a clear, quality image.

In paragraph 8 of the office action, claims 10-17, 20 and 27 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Wach, et al. in view of U.S. Patent 6,091,872 (Katoot). The Applicant agrees that the transmission of white light through fibers for illumination purposes is well known in the art, however, the Applicant reiterates his argument that Wach, et al. does not disclose a coherent fiber bundle capable of transmitting a clear image of the sample. Therefore, for that reason, the Applicant believes that the rejection of these claims under 35 U.S.C. § 103(a) has been traversed by the amendment made to the independent claims of the application from which they depend.

With respect to claim 17, the same remarks as applied to claim 8 above also apply to claim 17, mainly that a single spectral filter which is spatially patterned into a first portion for filtering laser light and a second transparent portion is not disclosed by the cited passage of Wach, et al.

In paragraph 9, the Examiner has rejected claim 23 as being unpatentable under 35 U.S.C. § 103(a) over Wach, et al. in view of U.S. Patent 6,006,001 (Alfano, et al.). Claim 23 is dependent from newly amended claim 1 and for that reason, in light of that amendment and the remarks herein, claim 23 should also be patentable. However, the Examiner states that is would have been obvious to one having ordinary skill in the art at the time of the invention to combine the fiberscope of Wach, et al. with the fiberscope assembly of Alfano, et al. The Applicant respectfully submits that the last limitation of claim 23, which is a "link for directing the output under laser illumination conditions to a Raman chemical imaging spectrometer and detector is not disclosed by Alfano, et al. because Alfano, et al. teaches the use of the assembly only for optical spectroscopy and not for chemical imaging. The Applicant directs the Examiner's attention to Figure 4 of Alfano, et al. which shows a cross-section of the end of the fiberscope described in Alfano, et al. As can be seen in that Figure, reference number 29 refers to the individual collection fibers. The figure shows eleven collection fibers and a structure very similar to that disclosed by Wach, et al. As discussed earlier with respect to Wach, such a small number of fibers is not suitable for the collection of white light images or Raman chemical images. Therefore, Alfano, et al. does not disclose both a link for detecting the output under a laser illuminations to a Raman spectrometer and a link for directing the output under laser illumination conditions to a Raman chemical imaging spectrometer as is claimed in claim 23. Further, Figure 6 of Alfano, et al shows only one link to a box labeled "Spectrograph, detector." There is not an

additional link shown directed to an imaging component. Therefore, the Applicant respectfully submits that claim 23 is patentable both because it is based on a patentable base claim, namely claim 1, and because of the lack of a disclosure of a link to a Raman chemical imaging spectrometer or a white light video display device.

In paragraph 10, the Examiner has rejected claims 24 and 25 under 35 U.S.C. § 103(a) as being unpatentable over Wach, et al. in view of Cooney. Although the reference does mention that liquid crystal tunable filters have been used in Raman microscopes, the reference teaches away from the use of LCTFs in favor of AOTFs in lines 32-45 of column 1. The act of teaching away from the use LCTF technology in preference to the AOTF technology by the authors, who were skilled in art at the time, indicates that the use of an LCTF was not obvious and therefore, the argument for rejection constructed in paragraph 10 is not appropriate.

Further, with respect to LCTFs, which were originally developed for color imaging applications and not Raman imaging, versus AOTFs, conventional wisdom in the field at the time of the invention taught away from the use of LCTFs in favor of AOTFs for two reasons. First AOTFs are capable of being tuned in a manner which is much faster that the LCTFs. This was one motivating factor in creating the preference among those of skill in the art for AOTFs instead of LCTFs. However, the present Applicants have realized that the time limitation in this invention lies not with the time to tune the filter, but with the time necessary for the camera to capture the image. Therefore the use of LCTFs, with their longer tuning time limitation, is appropriate for this application. Second, the LCTFs transmit a lower percentage of light than do AOTFs. This characteristic of LCTFs was an additional motivating factor among those of skill in the art for moving to using AOTFs instead of LCTFs. However, the Applicants have realized that a more important characteristic of the tunable filter is the total throughput of the filter, as opposed to the percentage of light transmitted. Thus, for this additional reason, LCTFs, which generally have a larger aperture area than do AOTFs, are an appropriate choice for this application.

CONCLUSION

The Applicant has amended the independent claims of the application to include limitations that, when taken in combination with the other limitations of the independent claims are not shown in the prior art. Namely, the addition of the limitation that the collection fibers be a "coherent fiber bundle" which is capable of transmitting a clear and organized image of the

sample. It is clear that a fiber bundle containing six or seven fibers or as disclosed in Wach, et al. or eleven fibers as disclosed in Alfano, et al. is not sufficient to transmit a clear image of a sample, whether it is illuminated by white light or by scattered Raman light. The Applicant therefore respectfully submits that all independent claims as amended should now be patentable based on the art cited by the Examiner and, as a result, all dependent claims should also be patentable as being derived from patentable parent claims.

The Applicant requests that the Examiner contact the Applicant's attorney, listed below, with any questions or suggestions regarding the claim as amended or the remarks contained herein. At this time, the Applicant believes that all claims are in condition for allowance and asks the Examiner to allow all claims of the application at the earliest possible time.

Respectfully Submitted,

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